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ABSTRACTS OF TUBERCULOSIS

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Calmette's Vaccination of Cattle Against Tuberculosis.—In August, 1906, and July, 1907, it was shown that either multiple reinfections or single massive infections invariably lead to the development of a fatal tuberculosis, but that the sickness produced by a single contamination habitually heals if the animal is guarded from further accidental contagion. The experiments furnished proof that animals cured to the point of no longer reacting to tuberculin are no longer susceptible, at least for a period, of being reinfected, even with virulent bacilli ordinarily capable of causing an acute fatal tuberculosis within a few weeks. This led to experiments directed toward obtaining immunity by vaccination. It was finally shown that the tolerance of the body toward tuberculous infection or reinfection is a function of the presence in that body of living bacilli, and that young calves may be rendered artificially tolerant by introducing into their circulation a suitable dose of so called "biliated" bovine bacilli, avirulent and nontuberculogenic, but still endowed with a certain toxicity and capable of provoking the formation of antibodies. The bacilli used are from a very virulent bovine source, called *lait de Nocard*, transplanted for the first time on potato cooked in 5 per cent glycerinated ox-bile, January, 1908, and transplanted every fifteen days on the same medium. After four years this bacillus was no longer virulent for oxen but was still pathogenic for horses. After thirteen years of successive cultures and transplants it was completely deprived of virulence, even in large doses, for all animal species. It also became incapable of provoking tubercle formation by intravenous, intraperitoneal or subcutaneous injection, or by ingestion. The culture was then preserved on ordinary glycerinated potato medium. In appearance this culture resembles ordinary tubercle-bacillus cultures, except that it is less dry, more oily and easier to smear. It also produces tuberculin, although it appeared to have lost this property in the presence of bile. Doses over 3 mgm., injected subcutaneously in guinea pigs, produce a small abscess which heals spontaneously, and with no lymphatic reaction. None of the animals became tuberculous nor was it possible by successive reinoculations to restore tuberculogenic properties. Thus we have a race of *truly avirulent bovine tubercle bacilli*, entirely harmless for all species of animals, including the chimpanzee and man, even when a dose of 40 million bacilli (1 mgm.) is given intravenously. This culture has been designated as *BCG*. *Interpretation of tuberculin reactions in vaccinated animals:* The rapidity with which animals vaccinated intravenously cease to react to tuberculin is striking. At the same time they become quite tolerant to virulent bacilli. If such tolerance is due to the presence of living bacilli, it should cease with their elimination, and the duration of the tolerance should be prolonged by a method of administration which will delay such elimination. Experiments were accordingly carried out which showed that animals inoculated subcutaneously with the bacillus vaccine preserved their power of reacting to tuberculin longer than those inoculated intravenously. This persistent sensitiveness to tuberculin seems to be correlated with the symbiotic life of the tubercle bacillus and certain fixed cellular elements, so that the body reacts in a characteristic way. An example is the so called *Koch's phenomenon*. It therefore appears that resistance to tuberculous reinfections is evidenced by sensitiveness to tuberculin. Consequently, a positive tuberculin reaction ought no longer to be considered a criterion of infection, but rather of immunity. For this reason, it loses diagnos-

tic significance, since animals artificially immunized with avirulent bacilli give the same reaction as infected subjects. *Fate of bacillus vaccine introduced subcutaneously:* If a small dose, such as 2 mgm., is given a healthy calf under the skin of the dewlap, there is no visible local reaction and no reaction to the tuberculin test. On the other hand, if 50 to 100 mgm. are given, a local lesion develops almost immediately, but with no tendency to break down, and eventually it disappears without a trace. However, one heifer given a 50 mgm. dose, with a positive intradermic reaction ten months later, developed a persistent cyst about the size of a pigeon's egg in the cellular tissues, which was found to contain a serous liquid, rich in granular, poorly staining bacilli. Cultures on Petroff's medium were sterile, and four guinea pigs inoculated were found perfectly healthy when killed three months later. The conclusion was then drawn that the bacilli were either dead or devitalized. Thus, this *massive inoculation of bacillus-vaccine is and remains innocuous.* It seemed interesting to determine whether virulent tubercle bacilli under the same conditions underwent the same degradation. We already know that such bacilli, shut up in collodion sacs, and placed in the peritoneum of rabbits, cease after several months to be viable. For this experiment in cattle little balls of pumice stone 10 mm. in diameter were filled under a vacuum with a concentrated emulsion of virulent bovine bacilli, about 2.5 mgm. per ball. These were inserted in the deep tissue beneath the skin of the dewlap. The operative wound, closed by sutures, healed by first intension. One could easily make out the foreign body by palpation; also a slight cellular reaction. At no time, up to six months after, did the animal react to tuberculin. Six months later the ball was removed, crushed and triturated in an agate mortar in 5 cc. of physiological salt solution. The product showed under the microscope a considerable number of granular bacilli easily stained by carbol-fuchsin. Inoculation into four guinea pigs gave negative results. The calf which had carried this ball was inoculated the same day intravenously with 5 mgm. of virulent bacilli and succumbed in forty-eight hours to an acute pulmonary tuberculosis, having acquired no resistance, there having been no symbiosis between the bacilli and the body cells. In the guinea pig, experiments have shown that Koch's phenomenon depends on the relative dose of the bacilli of reinfection. If the dose is equal or larger than that of the first infection, there is rapid abscess formation, which soon sloughs and cicatrizes. There is no doubt that calves, spontaneously infected and reacting to tuberculin, show considerable resistance even to massive reinfections. One heifer, affected with benign lesions of tuberculosis for more than two years, was capable of standing an artificial reinfection of over 200 million bacilli of high virulence. *Vaccination experiments in calves by subcutaneous massive inoculation of BCG*: Twenty calves, from seven to eight months of age, and free from tuberculosis, were divided into two lots. Twelve were vaccinated, 8 serving as controls. The 12 of the first lot were divided into six groups of two each, occupying boxes in pairs. The odd numbers received a subcutaneous injection of 100 mgm. of *BCG* emulsion, the even ones 50 mgm. One control was used for each group, and a virulent inoculation given to both, one, three, six, twelve, fifteen and eighteen months after vaccination; likewise, at the same time to the control. *Reaction to vaccination:* The local reaction, appearing twenty-four hours after inoculation, consists of a soft edematous mass the size of a nut or an egg, later becoming dense, hard and mobile. There is no tendency to suppuration. In one animal which died of complications this mass was found to resemble old tuberculous lymph node lesions. Within a resistant capsule was a nucleus containing poorly staining bacillary bodies. The vaccinal lesion slowly subsides, disappearing about the tenth to eighteenth month. It is always painless. General reactions were noted in only 25 per cent of the animals, consisting of a sharp febrile attack about the fifteenth to eighteenth day, with depression and anorexia. The fever disappears after five or six days and the general condition remains excellent. This late reaction must be due to a bacillary septicemia, as a greater or lesser number of bacillary bodies reach the circulation. Intracutaneous tuberculin tests were done on the animals and found to be positive as long as the vaccinal lesion persists, becoming negative between the sixth and twelfth months. *Reaction of controls to inoculation:* For this a bovine bacillus isolated directly from a pleural lesion on Petroff's medium was used, of which 1/250 mgm. killed a guinea pig in less than three months after subcutaneous injection. The dose employed was uniformly 5 mgm. in the jugular vein. In the controls this was never followed by an immediate febrile reaction. It was only after thirteen to fifteen days that a marked hyperthermia developed, together with cough and increased respiration to 80 or more. Death occurred between the thirteenth and forty-eighth days, from massive pulmonary tuberculosis. A few controls developed elevated temperature from the fourth to the sixth day, last-

ing not more than three days. Later the fever reappeared, as in the others, but after eight or twelve days showed a tendency to a daily lowering, with improved general condition and easier respiration; nevertheless, the cough persisted and death occurred within a few months. This early thermic reaction appears, then, to be an indication of increased resistance, possibly conferred by a slight preexisting lesion. *Reaction of the vaccinated animals to virulent inoculation:* Here there is always an immediate and violent febrile reaction, reaching a maximum at nine to twelve hours after the injection, sometimes quickly disappearing, sometimes persisting three to six days. Generally the animal is all right at the end of forty-eight hours and has no further symptoms. This immediate and constant reaction is certainly of tuberculinic nature as may be shown by giving a preliminary dose of tuberculin forty-eight hours before, which itself induces a reaction and prevents that from the inoculation later. *Results of experiments for each group of vaccinated calves:* In group 1 the control was first killed sixty days after virulent inoculation. It was greatly emaciated, and autopsy showed miliary tubercles in all stages, some undergoing caseation. One of the vaccinated animals contracted a bronchitis and died five months after inoculation. Autopsy showed no tuberculous lesion, but an emulsion of the tracheobronchial lymph nodes produced a specific adenitis in four guinea pigs. The other vaccinated animal remained well and was killed after twelve months. Autopsy showed no tuberculous lesion and the left tracheobronchial node, ground up, failed to infect four guinea pigs, no lesion being found after forty-five days. In group 2 the control died, after forty-four days of massive pulmonary tuberculosis. The vaccinated animals, inoculated three months after vaccination, were killed after eleven months, neither showing evidence of tuberculosis; the tracheobronchial nodes of only one of them caused tuberculosis in guinea pigs. In group 3, the control, killed after sixty days, showed bilateral miliary pulmonary tuberculosis with foci of hepatization, while the two vaccinated animals, inoculated six months after vaccination were in a good state of health after eight months; autopsy of the latter showed no demonstrable tuberculosis, but the guinea pigs inoculated with the tracheobronchial nodes showed, after forty-five days, a specific adenitis. The same was true of the vaccinated animals in group 4, inoculated twelve months after vaccination, while two controls showed heavy tuberculous involvement after thirty-two and fifty-eight days, respectively. In group 5, one of the vaccinated animals inoculated fifteen months after vaccination, died of ulcerative gastritis; the other, killed after two months, showed only rather voluminous and succulent bronchial and mediastinal nodes; the control died after fifty-four days of acute miliary tuberculosis. In group 6 the vaccinated animals were inoculated eighteen months later. The control died forty-two days after inoculation of massive pulmonary tuberculosis. The two vaccinated animals were killed two months after the virulent inoculation. One of these animals showed only enlarged bronchial and mediastinal nodes. The other, which had not given the usual febrile reaction to the virulent inoculation, showed lesions of pulmonary and lymphatic sclerosis. *Principles of a new prophylaxis of bovine tuberculosis based on the preceding experiments:* The facts cited above show the possbility of conferring on young calves for a period of time extending well over a year a manifest resistance to tuberculous infection. The bacillus vaccine has proven innocuous and incapable of producing tuberculosis. It acts like a saprophyte, is eliminated, and its dissemination is not in the least dangerous. These qualities are not possessed by any other vaccines previously employed or proposed, all of which are in varying degree virulent and tuberculogenic, such as those of Behring, Koch and Schütz, T. Smith, MacFadyean, Arloing, and Vallée. There are excellent reasons for believing that the use of *BCG* will contribute toward lessening tuberculous disease, and especially so in young subjects. The immunity with which we are dealing ceases when the initial symbiosis of bacilli and cells ceases. This immunity is believed to be analogous to that of smallpox vaccination, anthrax vaccination, or vaccination against typhoid fever or rabies. The effects of typhoid and anthrax vaccination scarcely last over a year, and of rabies and smallpox vaccination about seven years. In adults this tubercle-bacillus vaccine cannot be so effectively applied because of previous reinfection by virulent bacilli. Since the reporting of these experiments, generous offers have been made to try the preventive effects of *BCG* in agricultural areas long severely ravaged by tuberculosis. Early in 1921, M. Lallemant, Prefect of the Seine-Inférieure, was willing to offer access to one of the farms under his administration. Soon afterward, M. LeGrand, general adviser of this department, put at disposition his important farming lands at Gruville. Aid was enlisted of M. Richart, veterinary director of the Sanitary Service, and M. Marcel Boissière, veterinary at Valmont. Experiments of a similar nature were begun more recently (January, 1922) in the Siene-et-

Oise, thanks to the courtesy of M. de Chézelles and with the aid of M. Brinet, veterinary at Magny-en-Vexin. The problem was as follows: In a farm infected with tuberculosis, without changing the mode of existence or habitat of the animals, or the usual method of bringing up the young, is it possible by vaccinating the newly born in the first two weeks of their life, and revaccinating each year, to get rid of tuberculosis within a period of five years? At first it was thought to create subcutaneously a persistently active local lesion by the introduction of pumice stones, as described, charged with a bacillary emulsion. This method, however, was soon abondoned, and in 1922 these 28 animals and 32 more, newly born, were vaccinated by intravenous inoculation of 20 mgm. of *BCG*. Since January, 1923, the subcutaneous route of vaccination has been exclusively used, 58 animals being revaccinated and 48 young ones vaccinated for the first time. In February, 1924, there were 142 animals aged one, two and three years, revaccinated without any trouble. It is remarked that one cannot count on tuberculin tests to find all suspects, since the reaction does not develop immediately on infection, and since deceptive tricks by veterinaries are quite common. *Conclusions: 1.* It is proved that with a dose of 50 to 100 mgm. of the modified bacilli, produced by a long series of successive cultures on 5 per cent glycerinated ox-bile combined with potato medium, injected subcutaneously, it is possible to vaccinate young animals against virulent bacillary infection so that they will not contract tuberculosis on intravenous injection of virulent bacilli, even as long as fifteen months after vaccination. Young calves thus vaccinated react positively to tuberculin during the entire period in which immunity is established. Some months later they cease to react and the immunity tends to disappear. *2.* Vaccination by the *BCG* bacilli is innocuous, not only for young calves and adult cows free from tuberculosis, but also for all species susceptible to tuberculous infection. Thus, *BCG* bacillus is completely deprived of virulence and cannot provoke tubercle formation. It is toxic only for tuberculous animals. Antibodies are produced which deviate complement. It is thought desirable that more extensive prophylactic trials against tuberculosis in cattle be carried out where sanitary surveillance can be properly exercised, and the authors are prepared to facilitate whatever experiments may be undertaken.—*Vaccination des bovidés contre la tuberculose et méthode nouvelle de prophylaxie de la tuberculose bovine, A. Calmette and C. Guérin, Ann. d. l'Inst. Pasteur, May, 1924, xxxviii, 371.*—(*A. P.*)

Sanatorium for French University Students.—In May, 1923, the medical section of the General Association of Students moved to learn how many French students were victims of tuberculosis and asked the *Congrès de l'Union Nationale* at Clermont-Ferrand to create without delay a university sanatorium for students. It was in a spirit of solidarity that our young friends proposed this. Do not many industrial groups have sanatoria, such as railroad men, and mine workers? Besides, the number of French establishments clearly being insufficient, many students find it impossible to receive the necessary care. Some, who are fortunately situated go to Switzerland, but often at the price of great sacrifice. Others must renounce the benefits of the cure because their resources will not permit it. For the last, above all, the outlook is distressing, their career broken. The *Union Nationale* states that this situation exists, is common and that many die for lack of care. The students' representatives have taken up the task, aided by their "old friend," Paul Straus, ex-Minister of Hygiene. A patronage committee was formed under the presidency of Leon Boingeois. It consists of the ministers of the Interior, of Public Instruction and of Hygiene, M. Honorat, former minister, author of the sanatorium law, Chauveau, president of the medical interparliamentary group, Senator Ferrand Merlin, Georges Risler, vice-president of the National Committee of Defense against Tuberculosis, Hudelo, director of Relief and Hygiene, Coville, director of Higher Instruction, the University rectors, M. Bellencoutre, President of the French Medical Association, Decour, President of the Union of Medical Syndicates. A medical and technical committee was organized, comprising all the real masters of tuberculosis, of which Leon Bernard is president. The first question to decide was that of location. An isolated institution was not to be considered. Two adjoining sanatoria were already built, at 18 km. distance from Grenoble, on the plateau of the Petites-Roches (altitude 1100 metres). This location was chosen by the students in consultation with the medical committee. Well exposed, but shut off from the north and east winds by mountain ridges, of easy access by a funicular, this plateau was thought most suitable. For economic reasons, the original idea of individual rooms was abandoned. A solarium, a ground floor, and three stories are to be constructed. The kitchen will be outside. The building will be in the shape of a fan, the wings at an angle of 135° with the central part. It will face north and south. There will be 105 beds, there being 32 double rooms and the rest single. An amusement

hall, a library and a laboratory will be connected with it. The state has furnished assistance in the sum of 1,300,000 francs, half the net total. The students themselves, however, have set a fine example by each one contributing annually a certain sum. The medical and administrative direction will be in the hands of Dr. Amabert, physician to the hospitals at Grenoble and to the sanatorium of the *Union Hôpitaliere*, with which the *Sanatorium des Etudiants* will have close connections. Three types of patients are to be considered: *1.* Students who can pay. Here there is no particular problem. *2.* Medical students who have contracted tuberculosis in hospital service. The insurance against professional risks will take care of these. *3.* Students with insufficient resources. Each association will have a special fund, and the University Council will undertake to carry a certain number of beds. A favorable mental and moral atmosphere will be aimed at and there will be opportunity for those able to continue some intellectual pursuits. Special attempts will be made to enlist the interest and coöperation of all university students.—*Projet de création d'un sanatorium universitaire, Presse Méd., July 12, 1924, no. 56, 1179.*—(*A. P.*)

Tuberculosis in Scotland.—The present position of tuberculosis in Scotland is one of hopefulness, whether considered from the point of view of mortality or that of the various antituberculosis measures. There has been a noteworthy drop in the number of deaths and this is found in all the varieties of the disease. Generally speaking, the death-rate from tuberculosis is highest in the large towns and smallest in the country districts. Several of the latter, however, show death rates far in excess of the cities. The high rate in these country districts is easily accounted for by the conditions under which the people live. The institutions in Scotland for the treatment of tuberculosis have grown considerably in recent years. There are now at least 104 sanatoria and hospitals approved by the Board of Health for the purpose. The total number of beds is 3,711. The number of approved dispensaries at the end of 1922 was 31. Other factors which influence the tuberculosis death rate are better housing for the working classes, better public health service and child welfare, and the greater attention given to tuberculosis in medical schools. Those in Scotland, who are striving for the prevention and arrest of tuberculosis, may be counted as optimists.—*The Tuberculosis Problem in Scotland, J. Guy, Brit. J. Tuberc., July, 1924, xviii, 102.*—(*B. T. McM.*)

Tuberculosis in Morocco.—At the last conference of the governors of the African colonies a resolution was adopted requesting Parisian physicians to cease sending their tuberculous patients to Morocco. Several weeks later, the single medical journal of the Protectorate published the results of enquiries among its readers on the subject of tuberculosis in that country. Tuberculosis has probably long existed in Morocco, but because of the slight importance of its cities and feebleness of local industries, etc., has not been widespread. The poorer classes did not live in houses, but in straw huts or tents, and their habits of life have not favored its development until recently. An exception to the rule is Fez, the capitol, where several families are accustomed to dwell together in dark, damp and poorly ventilated dwellings. Since the French occupation, however, conditions have changed. The cities have developed prodigiously, there has been much immigration much of it poorly housed, and the excellent sanitary regulations have not been enforced. The overpopulation of the cities has favored contagion, especially as many of the newcomers were tuberculous. During the war many natives became infected and later returned. Today one encounters much more frequently than ten years ago acute progressive forms of the disease among Mohammedans. The Jews resist better, but nevertheless succumb in increasing numbers, while the lower class Europeans in Moroccan cities live very wretchedly. The climate is not entirely as Europeans conceive it to be. It varies widely from Tangiers on the north to Mogador on the south, and when one leaves the coast there are found little more than military posts. The luminosity is indeed considerable, but there are excessive diurnal variations in temperature and frequent violent winds. The east winds are especially trying to the neuropathic and tuberculous and at Tangiers this wind may blow for three months almost steadily. According to Remlinger, this city is dangerous for the febrile and congestive forms. Only visceral, osseous and lymphatic tuberculosis achieves real benefit in such a climate. Casablanca is subject to dust-storms alternating with severe rains, and its climate is especially unsuited to French patients. Likewise, in some the cities of the interior, notably Fez and Petitjean, the winds are often violent. The best localities are the regions about Meknes and Marrakech. Meknes is 200 kilometres from the ocean, situated on a vast plateau, with a regular and stimulating climate. It is planned to build sanatoria in the mountains nearby, within a distance of 100 kilometres. Marra-

kech is, perhaps, still better possessing vast and superb gardens, and situated in a vast plain between two ranges of the snow-covered Atlas mountains. Its altitude is 500 metres. Its climate is temperate from October to the middle of July. The heat, when it comes, is dry, and rain is unusual. The atmosphere is very clear. It is a suitable place to send fibrous, or even caseous forms of tuberculosis. These facts ought to be borne in mind by French city physicians, as well as the susceptibility of patients, especially women and children to the dangers of long journeys.—*La tuberculose au Maroc, L. d'Anfreville de la Salle, Presse Méd., June 28, 1924, no. 52, 1091.*—(*A. P.*)

Tuberculosis Mortality of Ruhr Miners.—The tuberculosis mortality of the miners in the Ruhr was lower before the war than for other occupations. As a cause for this difference are to be considered the nonemployment of the unfit in mining, partly voluntarily and partly as a result of medical advice; the speedy exclusion of the incapable; the possibility of early invalidization in the mines; the relatively slight opportunity of droplet, dust or contact infection as compared with other trades; the relatively slight harmfulness of coal dust for the lung tissues; and possibly a certain detrimental influence of coal dust for tubercle bacilli. The increased tuberculosis mortality of the Ruhr miners according to statistics is more apparent than real, and is explained by the fact that the strongest workers were called into service and that inferior individuals and war prisoners replaced them. The tuberculosis mortality was, therefore, not greater during 1914 to 1916 than in the years shortly before the war. During 1917 to 1919 the mortality was as a whole increased, but always remained below the total general mortality. After the war it was lower than during the warm but it did not drop to the prewar figures.—*Die Tuberkulosesterblichkeit der Bergarbeiter im Ruhrgebiet vor, in und nach dem Kriege, B. Heymann and K. Freudenberg Ztschr. f. Hyg., 1924, cl, 245.*—(*H. J. C.*)

German Tuberculosis Sanatoria and Dispensaries.—In a review of the development of sanatoria in Germany it appears that Pütter established the first dispensaries and sanatoria in Hale in 1898. While in 1905 there existed 42 sanatoria and 60 tuberculosis branches, in 1919 there were 1,258 main and 800 coöperating sanatoria, so that 29,500 patients had access to sanatoria. The system was best developed in Baden and Thüringen and least in Württemberg, where there was only one sanatorium for 330,000 inhabitants.—*Die Auskunfts- und Fürsorgestelle für Lungenkranke wie sie ist und wie sie sein soll, K. W. Jölten, Beitr. z. Klin. d. Tuberk., June, 1923, lv, 109,*—(*H. J. C.*)

Responsibility of Medical Profession toward Tuberculosis.—Tuberculosis, its prevention and control, is one of the greatest problems of this country. The guidance and leadership of the antituberculosis campaign must rest with the medical profession. To continue in the future the remarkable progress that has been made in the past, medical schools must give adequate instruction on the subject. Medical practitioners of all kinds must be made to feel that their duty to the community demands that they at least have an interest in the tuberculosis campaign even if they do not take an active part in it. The admirable papers presented each year at the meeting of the tuberculosis section of the Massachusetts Medical Society do not attract or reach the general practitioner for whom they are intended and for whom they are of value. The wards of leading general hospitals are closed or rather supposed to be closed as far as tuberculosis is concerned. To change this apathy toward tuberculosis we must: *1.* Exert influence to see that tuberculosis is given adequate attention in our medical schools. Publicity is the best remedy. *2.* Exert similar influences on governing boards of general hospitals to have special observation and diagnostic wards for tuberculosis. *3.* See that on the yearly program of state, county and local medical societies and associations of all kinds the subject of tuberculosis holds a place. If possible, see that some one delivers such talks or papers who can speak well or with authority. *4.* Try to enroll the younger doctors, especially those just graduating from hospitals, in local tuberculosis work.—*The Responsibility of the Medical Profession toward Tuberculosis, J. B. Hawes, Jr., Boston M. & S. J., August 21, 1924, cxci, 353.*—(*B. T. McM.*)

Training of Tuberculosis Nurses.—The Society of Superintendents of Tuberculosis Institutions has just concluded its first examination for nurses in pulmonary tuberculosis. In instituting this specal examination it is hoped to provide the general trained nurse with a specialist qualification, and to add to her equipment for various public health posts, and also to fit the untrained woman for work in the sanatorium or chest hospital. These untrained women are, for the most part, those who will later proceed to a general training. They also include those who have broken down while undergoing general training, and a number of

others physically incapable of standing the regimen of a general hospital. In general, hospital nurses learn very little about the nursing and treatment of pulmonary tuberculosis and, for this, systematic training is necessary. The care of the tuberculous offers a field of service and interest to the true nurse who has got over the glamor of the operating theatre.—*Training of Nurses for the Care of Cases of Pulmonary Tuberculosis, P. E. Edwards, Brit. J. Tuberc., July, 1924, xviii, 100.*—(*B. T. McM.*)

Impression of English Training Colonies.—This is a personal report of the last meeting of the National Association for the Prevention of Tuberculosis (England), which concentrated its attention on the part played by training colonies in the campaign against tuberculosis and on the organization of care committees. The discussion was, on the whole, unfavorable to training colonies if they were to be regarded as agencies for teaching tuberculous men a new occupation which would be their future means of livelihood.—*The Annual Conference of the National Association for the Prevention of Tuberculosis: An Impression, W. A. Daley, Brit. J. Tuberc., October, 1924, xviii, 156.*—(*J. B. A.*)

Practicability of Tuberculosis Village Settlement.—The difficulties in England of finding suitable employment for sanatorium ex-patients are well nigh insuperable. It is not merely a question of employment but also one, equally important, of housing. We waste money when we deal with the consumptive only and neglect his family. If there is one lesson which Papworth has taught, it is that the basis of successful treatment of the consumptive is economic. For the ordinary commercial concern the consumptive employee is an unremunerative asset—he earns no dividend on the capital invested by his employer. However the average ex-patient can earn his wage at his own trade provided the large overhead charges are taken off his shoulders, and provided the environment is adapted to his condition both mentally and physically. It is to the interest of every manufacturing concern, therefore, to arrange to transfer such workers from the normal workshop to the substandard workshop in the nearby village settlement. The factory in the town has its counterpart in the settlement, the latter differing from the former in the following respects: hours regulated to the consumptive's strength; pace moderate; dividend earnings much reduced or entirely foregone. All grades of workers can be employed. Housing accomodations, as at Papworth, and all the amenities of life must be provided. The result will be a happy, contented population; hope instead of anxiety; family life instead of separation. Training the ex-patient for a new occupation is usually a failure. What he wants is security of employment, a fair wage for a fair day's work, and an opportunity to invest his capital which is the knowledge he has acquired of his trade from the apprenticeship stage onward. A change of occupation means a destruction of this capital, which has proved disastrous. Let the man, then, use his own capital whether he be manager, foreman, or craftsman, and let the industries be linked with those run by healthy workers outside, and, as at Papworth, the result will prove successful.—*The Evolution of the Tuberculosis Village Settlement, P. C. Varrier-Jones, Brit. J. Tuberc., October, 1924, xviii,* 131.—(*J. B. A.*)

Training Colonies for Tuberculosis Patients.—The original conception of the "colony" in England was that, while the patient after discharge from the sanatorium still remained under medical supervision, his daily life should gradually approximate the the conditions of the ordinary working man's daily existence. For the newly trained colonist a definite and suitable post was found before discharge from the colony. The cost of training and treatment at the original farm colony was low. The farm colony was included in the model tuberculosis scheme adopted and recommended by the Departmental Committee on Tuberculosis (1912–13). Since this time the idea has developed further with the establishment of different types of training centres, discussed as follows: *Vocational training colonies:* The basic principle of these institutions is to provide twelve months' training in an occupation suitable for the tuberculous male patient, in the expectation that at the end of that period the trainee can leave the colony and support himself by his own exertions in the new occupation. The occupations selected were pig and poultry-farming, market-gardening, rural carpentry, clock and watch-repairing, etc. Such a transition to a new occupation for the tuberculosis patient, especially when he has had to compete on equal terms with the healthy industrial operative has usually ended in failure. The period of training is short and very little attempt has been made to place the trainees after they leave the colony. *Village settlements:* These places, designed after the Papworth scheme, were established to allow the patient to live with his family while employed at a suitable occupation and still under medical supervision; no advanced

cases were included. The cost of this plan is too great to permit of its wide adoption; many patients are temperamentally unsuited for such life; and at best only a limited number could be provided for in this way. *Vocational training colleges:* Plants, unsuitable for the purpose, were often purchased for these establishments. Men, unsuitable for colony life, were taken in. Training rather than treatment has been emphasized. Failure in all these projects will be experienced until it is realized that the colony is an expansion of the sanatorium for a certain proportion of patients for whom such extended treatment is necessary. A plea is made for early treatment so that the large number of advanced cases, suitable only for care in special hospitals or institutions, is reduced to a minimum. The keynote of the tuberculosis dispensary, tuberculosis school, sanatorium, and training colony is "detuberculization" and recovery, their purpose being to anticipate events and prevent the development of gross manifestations.—*Training Colonies for the Tuberculous, F. N. K. Menzies, Brit. J. Tuberc., October, 1924, xviii, 133.*—(*J. B. A.*)

Searching for Tuberculosis Patients.—A voluntary organizaton has done a great deal to find cases of tuberculosis and to either report or send the patients to the sanatorium. Of the deaths in the district during the year, 17 per cent were not known to the sanatorium, although all cases had had a physician and all should by law be reported to the sanatorium. During the year 2778 patients were seen by the examining physicians of the sanatorium. Of this number 124 had no signs of tuberculosis, 40 were sick of nonpulmonary disease and 161, sent in for questionable tuberculosis, were found to have various lung diseases. The agency at the sanatorium properly places these patients in sanatoria, hospitals, seashore resorts, open-air schools in the woods, etc.—*Jahresbericht der Fürsorgestelle für Lungenkranke und Tuberkulose aller Art Bielefeld—Stadt für das Jahr 1923, Paetsch, Deutsche med. Wchnschr., June 27, 1924, i, 886.*—(*H. S. W.*)

Effect of Winds on Phthisis.—Gordon in 1899, while searching for the most suitable site for a sanatorium, found to his great astonishment that the localities then accounted ideal, sheltered from north and east winds but open to the south and west, were precisely those in which the mortality from phthisis was greatest. To test the accuracy of this finding a test was made. In four separate rural sanitary districts in different parts of Devon, with an aggregate population of over 85,000 persons, the phthisis death-rates were examined, and in every one of these districts the correspondence between relative exposure to west and southwest winds and relatively high phthisis mortality was found strikingly apparent. An investigation into the female phthisis death-rate in other districts in Devon showed a definite though slighter effect of northwest wind. In a third test not only was the effect of exposure to northwest, west and southwest winds upon female phthisis mortality evident for forty-five years, but was evident in the nine successive five-yearly periods except the first. During the twenty years following Koch's discovery of the tubercle bacillus, the contrast in the death-rates between exposure and shelter became more marked. These last two tests were the subject of an independent inquiry, the findings of which bore out the results. In a fourth test it was found that the streets of Exeter, the roadway of which were swept by the westerly winds, had about twice the female phthisis death rate of those in which the roadways were sheltered. When specially exposed roadways were compared with specially sheltered ones the ratio became nearly four to one. These four tests showed that in Devonshire populations exposed to prevalent rain-bearing winds suffer more from phthisis than populations sheltered from them. A search for contraindication was made in other parts of the world, but none were found. The same conditions influence bovine tuberculosis. When fully exposed farms were compared with fully sheltered ones the exposed were found to have four times as much tuberculosis among the cattle as the sheltered. The effect on phthisis patients is shown in the fact that all the great phthisis health resorts which have been conspicuously successful have been situated in pronounced shelter from prevalent, strong, rain-bearing winds. The duration of the disease was less in exposed areas. As regards "shelter" and "exposure" 100 feet of altitude shelters half a mile to the leeward of it well, and a further half-mile fairly. Beyond the mile from the 100 feet its shelter must be regarded as ceasing, and dwellings situated farther off will be exposed. *Conclusions:* There is a mass of diverse evidence, all clearly pointing to one and the same thing, namely, a profound influence exerted upon phthisis by prevalent, strong, rain-bearing winds, affecting both its incidence and its course. In respect of incidence no mere climatic factor has so powerful an effect, and among social factors only occupation equals it in importance. It may be safely said that the chance of becoming phthisical is at least twice as great in exposure to these winds as it is in shelter from them. As regards course it may be fairly said that the chance of recovery is at least

twice as great in shelter from these winds as it is in exposure to them, and, therefore, there is no detail of treatment more vitally important to the patient than the placing of him in effective shelter.—*Wet Winds and Early Phthisis, W. Gordon, Brit., M. J., November 29, 1924, no. 3335, 983.—(B. T. McM.)*

Relative Infectiousness of Open and Closed Tuberculosis.—It is an easy matter to demonstrate tubercle bacilli in the sputum of cases of open pulmonary tuberculosis. Such cases should always be dealt with hygienically, so as to limit their danger to others, and they should have places in any scheme of treatment. But in the "facultative open" cases demonstration of bacilli in the sputum is not so readily made, for numerous, repeated, painstaking examinations, even at times with animal inoculation, may be necessary for bacillary demonstration. Such cases, in which the bacilli can usually be found, also require hygienic oversight and treatment. The closed cases should be watched and treated, if the latter can be done, because they may become open cases.—*Ueber die Abgrenzung der ansteckungsfähigen Lungentuberkulosen gegen die nicht ansteckungsfähigen, H. Braeuning, Deutsche med. Wchnschr., August 1, 1924, 1, 1048.—(H. S. W.)*

Influence of Syphilis on Pulmonary Tuberculosis.—Opinion on the influence of syphilis on the origin and course of pulmonary tuberculosis is divided. While one group of authors believes syphilis to have a favorable effect, others believe that it gives a bad prognosis and favors the development of pulmonary tuberculosis. The material studied contains a strongly syphilitic group of 1300 prostitutes of Berlin. Among the Wassermann-positive cases there were 12.5 per cent of cases of active tuberculosis, while among the Wassermann-negative cases 10.7 per cent, that is, only a slightly greater proportion among the syphilitics. The influence of an existing or developed syphilis on the course of tuberculosis is given in tabular form. The cirrhotic nodose or nodose-cirrhotic forms of tuberculosis predominate. As a whole, the combination of the two diseases has an unfavorable effect upon the tuberculosis prognosis, which may be counteracted by antisyphilitic treatment. In tuberculosis originating soon after a syphilitic infection the prognosis is unfavorable. An unfavorable effect was especially pronounced during the more youthful years. Later stages of tuberculosis are not especially influenced by a syphilis developing during their course. Syphilis developing shortly after the appearance of an active tuberculosis seems to have an unfavorable influence on the tuberculosis.—*Über den Einfluss der Lues auf Verlauf und Entstehung der Lungentuberkulose, J.W. Samson, Zeitschr.f. Tuberk., December, 1923, xxxix, 161.—(H. J. C.)*

Exogenous Reinfection in Tuberculosis.—Whether tuberculosis develops from exogenous reinfection is of practical significance. Against the view of exogenous reinfection in lupus is the fact that definite reinfection skin tuberculosis does not have a lupoid character, and experimentally a typical lupus cannot be produced by exogenous reinfection. The insignificance of massive and repeated reinfection of the lungs of an allergic person is strikingly demonstrated by the enormous number of bacilli expectorated from a cavity, a condition which does not lead to disseminated tuberculous foci. Against the idea of exogenous reinfection is also the frequent coincident and symmetrical occurrence of pulmonary tuberculosis in both apices. Statistical epidemiological data also opposes the idea of exogenous reinfection. Even though there is as yet no exact evidence of the hematogenous origin of apical tuberculosis, the exogenous reinfection theory is also an unproved hypothesis.—*Kritisches zur exogenen Reinfektion bei der Tuberkulose, Ballin, Ztschr. f. Tuberk., October, 1923, xxxix, 26.—(H. J. C.)*

Traumatic Tuberculosis.—Brisard reports 4 cases in which the reality of the trauma was incontestable, and no tuberculous lesion was found on prior examination, including radiography. In these 4 cases the combination of the facts and the symptoms was clearly in favor of a traumatic tuberculosis, and the accident therefore indemnified as such. Such cases are very difficult from the medicolegal viewpoint, as it is not easy to exclude a previously latent tuberculosis.—*En marge de la tuberculose traumatique, Brisard, Meeting, Soc. d. Méd. Légale d. France, July 7, 1924, reported in Presse Méd., July 26, 1924, no. 60, 637.—(A. P.)*

Influence of War on Tuberculosis.—In agreement with the findings of other authors an unfavorable influence of the war on tuberculosis was noted, in the sense that the absolute mortality increased and its ratio during the war was higher than in peace. This increase was mainly limited to the war years. With improvement in nutrition the tuberculosis mortality not only returned to normal, but dropped below this figure. The increase in mortality was not uniform for all age periods. A greater effect on the young was noteworthy. On sex incidence the war had no influence.—*Tuber-*

kulose vor, während und nach dem Kriege, H. Fortwängler, Beitr. z. Klin. d. Tuberk., September, 1923, lvi, 275.—(H. J. C.)

Transmission of Avian Tubercle Bacilli through Eggs.—That avian bacilli are eliminated through the digestive tract is granted. Many have also claimed that the eggs of tuberculous fowls might contain bacilli which might infect the chick from the eggs and thus be carried back to the flock. In order to test this opinion 43 hens which gave a tuberculin skin reaction were isolated, and eggs (876) from these hens were inoculated into healthy, nonreacting fowls. Meticulous care was used to prevent contamination from the shells or from outside sources. Eggs from only three hens were found to contain bacilli, and on autopsy two of these three hens showed no evidence of tuberculosis. In all cases in which bacilli were present the inoculum was made not from one but always from a composite of three or more eggs. Inoculation studies of washings from the shells of 209 eggs coming from known tuberculous hens failed to show the presence of bacilli in a single instance. A safe conclusion is that less than 1 per cent of eggs from tuberculous hens contain bacilli.—*Reports of Experimental Work to Determine Whether Avian Tuberculosis Is Transmitted through the Eggs of Tuberculous Fowls, C. P. Fitch, E. R. Lubbehusen and Ruth N. Dickmans, J. Am. Vet. Med. Assn., October, 1924, lxvi (new series, xix), 43.—(H. S. W.)*

Tuberculosis among Copper and Slate Miners.—Lung tuberculosis among these miners takes on some unusual and important features. It is estimated that a miner who works for forty years breathes in from 48 to 480 gm. of dust. The miners live to an average age of fifty to sixty years. Many of these years they may be sick with "miner's disease"—dyspnea, cough and expectoration. Autopsy shows three types of lung change: (1) Soft lungs with irregular spots and a fine network of fibrous tissue, designated "dust lung." (2) Stiff lungs shot through with many black nodules up to the size of a pea, and between them extensive, diffuse, black or slate-like areas of the consistence and homogeneity of hard rubber, in which occasional cavities containing ink-like fluid occur. Microscopically, nodules and cavities were typically tuberculous. The slaty areas showed hyaline layers. (3) Lungs like those in group 2 (nodules and slaty areas) but without signs of fresh tuberculosis. X-ray studies corresponded to the pathological findings as disseminated, focalized and markedly focalized. The second and third types occurred only after a minimum of ten years had been spent underground. No tuberculosis was seen in patients who had been underground for as long as twenty years. Of 400 cases studied, caseous tuberculous pneumonia was seen only once and that in a man who had been underground only two and a half years. All other tuberculosis was cirrhotic, nodular tuberculosis, and the apices were usually free. Complement-fixation findings corresponded usually with the X-ray and autopsy diagnoses. Clinical findings were often contradictory. Dyspnea is the main complaint. Twelve per cent of the tuberculous miners had bacilli in their sputum. Most of these persons were between fifty and sixty years old, as compared with the twenty-five to forty-year average for non-miners. Bacilli in these miners may be considered as parasitic, or the miners as carriers of bacilli, since they have no symptoms referable to their tuberculosis. But all miners with "closed" tuberculosis must be under close observation because they are liable to develop bacilli in their sputum and thus become sources of danger. As a result of the lung fibrosis which follows prolonged exposure to dust, tuberculosis in such persons tends to become isolated and confined to walled-off areas in the lungs. No blanket condemnation of all dusty trades should be made, but each dusty trade must be measured as to its possibility of danger.—*Staublunge und Tuberkulose bei den Bergleuten des Mansfelder Kupferschieferbergbaues, F. Ickert, Deutsche med. Wchnschr., June 20, 1924, i, 832.—(H. S. W.)*

Congenital Tuberculosis.—Although the congenital tuberculosis theory of Baumgarten is disproved, the case here reported is of interest. The mother died twenty-four hours after labor with forcepts delivery. She had marked tuberculosis; one brother of the child had died, and the maternal grandmother was tuberculous. The child was born in a hospital, supposedly free from any tuberculosis, and was immediately isolated, and was never seen by any relative. It was normal at birth, but was observed closely and given a Pirquet test every week, beginning at the fourth. This became positive at the eighth week of life. From this time on there were temperature rises, but at first without physical signs; at the ninth week signs of bronchopneumonia, and at the eleventh week symptoms and signs of generalized miliary tuberculosis developed. The child died eight days later, and at autopsy showed miliary tuberculosis of lungs, liver and spleen, caseous lymph nodes at the hilum and in the mesentery, and

tuberculous ulcerations in the intestines. This need not be a case of congenital tuberculosis, for bacilli may well have got from the placenta into the mixture of maternal and foetal blood at birth.—*Ueber kongenitale Tuberkulose, W. Kuhle, Deutsche med. Wchnschr., June 13, 1924, i, 796.*—(*H. S. W.*)

Tuberculosis in Infancy.—In the first two years of life tuberculosis is apt to be disseminated; resistance is low, and the younger the infant the more generalized does the infection become. Practically all lesions seen at autopsy in this age period are acute. Fibrosis is unknown and calcification is rare. The points of entrance of the bacilli before or at the time of birth is the umbilical vein; after birth, the respiratory and digestive systems, less often the skin and conjunctiva. *1: Tuberculosis acquired before or during birth through the umbilical vein:* This may occur if the mother had tuberculous endometritis or placentitis, which are rare, or a bacillemia at the onset of labor without tubercles in the placenta. In the latter event, bacilli may enter the torn fetal placental vessels. In either case the bacilli are carried directly to the liver, and then through the inferior vena cava to the right heart, and so on to the lungs, before reaching the spleen and other viscera. Therefore, tubercles in the liver and its regional lymph nodes, are always more numerous and older than in any other viscus; the lungs show miliary tubercles without any older single focus. Congenital tuberculosis is not common, and only two cases have come under the writer's notice. *2: Tuberculosis acquired after birth through the respiratory tract:* In this experience 82 per cent of children under three years of age gave evidence that their tuberculosis had been acquired by inhalation. Inspired tubercle bacilli are taken up by phagocytes at any point of the respiratory mucosa and carried directly, or through the intercellular spaces, into the lymph vessels. These phagocytes may lodge at any point along the bronchial tree or in the alveolar wall, or they may pass to the hilum lymph nodes, whence they may be carried through the thoracic duct to the blood and through the right heart back to the lungs before any of them reach the general circulation. Hence, the lungs are doubly exposed. The primary lesion in an infant is usually a cheesy nodule, 0.25 to 1 cm. in diameter surrounded by a zone of miliary tubercles. The adjacent lung substance may be pink and well aerated, or there may be a narrow zone of congestion or of consolidation. As a rule the lesion is too small to be discovered on physical examination during life. Rarely, two nodules of about the same size may be present in different lobes. A lymph node, when it contains the primary focus, may or may not be enlarged, and all or a part of it may be affected. Autopsies on young infants agree with Krause's experimental findings that gross lesions in the lungs are not indispensable to the appearance of gross lesions in the tracheobronchial nodes. The primary lesion may for a time remain alone with a tendency to calcify, but in children under two years of age a focus rarely remains single for many months. The primary lesion is found more often on the right side than on the left, and in the upper or middle lobe more often than in the lower. *Type A: Generalized miliary tuberculosis without a focus demonstrable by physical signs:* Since tubercle bacilli from an active lesion in the lungs or bronchial lymph nodes must rapidly reach the venous blood through the thoracic duct, miliary tubercles form in the lung substance, which may remain well aerated, pink in color, and normal in consistence. The spleen is attacked as soon as the bacilli enter the systemic circulation, and those not filtered out here go on to the liver and other organs. Such cases are common in young infants, who then die of a more or less generalized miliary tuberculosis, a bacillemia. In a small proportion of these cases the primary focus in the lungs cannot be demonstrated by physical signs. Clinically, the chief complaint of the infant, such as digestive disturbance, gives no clue of the fundamental disease. A combination of persistent cough and loss of weight with some fever should make one suspicious of miliary tuberculosis. History of exposure to infection is important. The absence of a history of previous illness in these patients is common. The general appearance may be deceptive, but the presence of cyanosis without adequate reason is helpful. It is impossible to elicit abnormal physical signs from a lung containing only miliary tubercles. Persistent associated bronchitis may suggest the condition. The roentgenogram shows the miliary tubercles, which, however, may at times be simulated by multiple small abscesses, or multiple peribronchial pneumonic areas which are frequent in influenzal pneumonia. The liver and especially the spleen are usually enlarged. The temperature is often fluctuating but may be subnormal. The stools may be normal, even with intestinal ulcers. A positive tuberculin skin test is significant; if the test is negative it should be repeated. Tubercle bacilli are usually not present in the sputum. The blood count is of little value. The prognosis is fatal. *Type B: Generalized miliary tuberculosis with a focus demonstrable by physical signs: Bronchopneumonia, simple and cheesy:*

A child who has miliary tuberculosis sometimes acquires a nontuberculous bronchopneumonia which may be fatal. At autopsy the tubercles and pneumonic areas are found interspersed. In others a cheesy bronchopneumonia develops: the primary focus spreads locally, a wider zone of tubercles forms around it, and the alveoli of the surrounding lobules become filled with exudate which rapidly undergoes coagulation necrosis. The cheesy areas may coalesce and involve more or less of one lobe; often in the beginning they develop about small bronchi, giving a characteristic clover leaf appearance. Intervening lung tissue, pink and aerated for a time, soon becomes dark red and solid. Softening results in the formation of small or large cavities. The sputum contains many tubercle bacilli, the swallowing of which sets up intestinal ulceration, which may extend throughout the length of the gut. The bronchial lymph nodes become enlarged, cheesy and softened. Clinically the chief symptoms, in varying combination, are cough, fever, loss of weight, rapid respiration, and occasional vomiting. Unless cavity signs are present, it is impossible to differentiate, by physical signs, nontuberculous and tuberculous bronchopneumonia: other evidence must determine the etiology. In tuberculous bronchopneumonia, the superficial lymph nodes are not usually enlarged; but the reverse is true of the mediastinal nodes as shown by the roentgen ray. The presence of tuberculids may establish the diagnosis. The temperature curve varies, but in the first week is usually remittent; uncommonly, the temperature is constantly subnormal. Respiration is more rapid than would be accounted for by the physical signs. Weight is lost steadily. The total leucocyte count is more often over than below 10,000, and the polymorphonuclears are more often over than below 50 per cent of the white cells. The prognosis is probably always fatal. *Type C: General miliary tuberculosis with focal lesions in the meninges: Tuberculous meningitis:* Tuberculous meningitis terminates about 40 per cent of all cases of general miliary tuberculosis in children under two years of age. It occurs in a much higher percentage of cases which originate by inhalation of the tubercle bacilli than by ingestion. In most of the cases the human type of bacillus is present. The pathological appearance of the brain and meninges is described. No case of recovery has been observed at the Babies' Hospital (New York). Clinically the most significant combination of symptoms is drowsiness, irritability and vomiting. The duration of the disease, at the longest, is three to four weeks. A history of human contagion is usually obtained. The disease may appear in previously healthy and well-nourished children. Constipation and occasional vomiting are almost constant symptoms. Nutrition fails rapidly. Drowsiness is perhaps the most common condition early in the disease. Signs of variable cerebral irritation appear as a rule in the first week. The chest may be clear, or may show signs of tuberculous bronchopneumonia. A variability of stiffness and relaxation of the lower extremities in common; disturbances of reflexes are also variable. A *tache* is present in practically every case. The temperature is usually remittent, but may be normal or subnormal. Irregularities of breathing and of heart action are observed. Tubercle bacilli are found in the spinal fluid in 95 per cent of the cases. The number of cells is increased, lymphocytes usually predominating, and the test for globulin is positive. The prognosis is probably always fatal. *3: Tuberculosis acquired after birth through the digestive tract:* Ingested tubercle bacilli may be arrested at the following points: (a) Tonsils, from which they may pass to the regional lymph nodes. General tuberculosis from such a source is rare. (b) Bacilli may pass through the intestinal wall to the mesenteric lymph nodes, whence they reach the general circulation and localize in any organ prepared for them. (c) In addition to the mesenteric lymph nodes, the peritoneum may become involved, with the later development of more or less generalized tuberculosis. (d) Bacilli may lodge in the lymph follicles of the intestinal wall at any level and form typical ulcers; the stomach is infrequently affected. In primary tuberculosis of the digestive tract, the lungs and tracheobronchial lymph nodes may be normal; but if the child lives long enough miliary tuberculosis in the lungs and their lymph nodes results. *Tuberculous peritonitis* is found less often in young infants than in children over two years of age. The clinical symptoms include gradual increase in size of the abdomen, discomfort and pain in the abdomen, slight intermittent fever, and constipation. Tuberculous masses can be palpated, more often above the navel. Fluid is not commonly present. Treatment consists of heliotherapy, fresh air, and proper food; surgical treatment has proved most unsatisfactory. *4: Tuberculosis acquired after birth through the skin:* Any simple lesion or surgical wound of the skin may become the primary focus from which a generalized tuberculosis may develop. *Types of bacilli:* The bovine type causes the majority of infections of the cervical lymph nodes, the alimentary tract, and the peritoneum, while the human type causes pul-

monary tuberculosis and most cases of meningitis: mixed infection may occur. *Significance of positive tuberculin skin tests: 1.* In 75 per cent of infants under six months without evidences of tuberculosis, fatal tuberculosis will develop within the first year of life. 2. In similar cases between six and twelve months, 50 per cent will develop fatal tuberculosis within a year. 3. In similar cases between one and two years, from 25 to 50 per cent will develop the disease, but the prognosis is not uniformly fatal. Illustrative case records and reproductions of roentgenograms are included.—*The Pathology of Tuberculosis in Infancy, with Clinical Illustrations, F. H. Bartlett and Martha Wollstein, Am. J. Med. Sc., November, 1924, clviii, 704.*—(*J. B. A.*)

Tuberculosis in Infancy.—Two types of tuberculosis may be distinguished in infancy, an early and a late form. In the early form, despite a short period of good or fair gain in weight, symptoms appear within the first three months of life, to be followed by a rapid course to a fatal termination before the sixth month of age. At autopsy there is found a generalized tuberculosis, affecting lungs, liver, spleen, bronchial and mesenteric lymph nodes, and, less frequently, the meninges, bones and intestines. The history usually shows a strong tuberculous taint in the family, often the mother, father and brothers or sisters also having the disease. The children observed by the author were removed from the mother as soon as the cord was tied, and although they apparently did well for one or two months, the Pirquet test became positive between the sixth and tenth weeks, becoming negative again at the height of the symptoms. A hematogenous infection could be assumed because the placentas showed definite tuberculosis. It seems probable, however, that infection did not occur until the birth of the child, at which time the placenta was torn and the tubercle bacilli liberated in the blood stream. Intrauterine infection is much rarer, one such case of Zarfl's showing a positive Pirquet at 17 days of age. Even after such hematogenous infection through the umbilical vessels, the first lesions may appear in the lungs rather than in the liver and adjacent lymph nodes. The susceptibility to tuberculosis varies greatly; for, although instances of infection after very short exposure occur, in other cases prolonged contact, even for months, may fail to cause infection. Since tuberculosis of the placenta has been shown to be much commoner than was formerly believed, hematogenous infection is probably a much more important occurrence than is usually assumed. The late form of tuberculosis in infancy is much more important than the early type because it is much commoner. This type is practically always due to an aerogenous infection through direct contact and, running a chronic course, offers a much better prognosis. The diagnosis may be difficult in the infant by the positive Pirquet test, and hilum tuberculosis as revealed by roentgen ray serves to establish the diagnosis. The roentgen shadows of lymph nodes, and also pulmonary infiltration, often show a slow but most amazing regression. The total mortality among infants in this clinic was 60 per cent, including the early form.—*Zur Tuberkulose im Säuglingsalter, L. Moll, Monatschr. f. Kinderhk., April, 1924, xxviii, 58.*—(*T. C. H.*)

Tuberculosis in Infants Less Than One Year Old.—Marfan discusses the generalized forms of tuberculosis in early infancy, remarking on the rarity with which tubercle bacilli are localized in the tracheobronchial nodes at this age. The path of dissemination is by way of the blood or by way of the lymphatics. The author makes the following classification: *Granulie chronique*, generalized discrete tuberculosis, and *Granulie aigue*, generalized confluent tuberculosis, the course in the former being that of any chronic wasting condition, the course in the latter being stormy and often with complicating tuberculous meningitis. Bronchitides, pulmonary congestions, and "paratuberculous" bronchopneumonias, occurring at the onset or during the course of "ganglio-pulmonary" tuberculosis in early infancy, are not uncommon and often confuse the whole clinical picture. On the other hand, tuberculous bronchopneumonia may occur secondary to other infections, simulating ordinary subacute bronchopneumonia. Marfan emphasizes that ulcerative tuberculosis and pulmonary cavity formation are by no means as rare in early infancy as is commonly supposed. Fibrinous or fibrous pleurisy may occur; but pleurisy with effusion is extremely rare at this age. Pneumothorax, though it may occur in tuberculosis, is more commonly due to other causes.—*La Tuberculose des enfants du premier age, A. B. Marfan, Nourrisson, September, 1924, xxi, 289.*—(*P. J. W.*)

Roentgenographic Appearance of Chest in Infants.—At St. Anthony's Hospital, Denver, a plan was arranged whereby the newborn child could be roentgenographed immediately on delivery; also thereafter in five minutes, ten minutes, fifteen minutes, twenty-four hours, and before leaving the hospital. A few still-

born infants also were roentgenographed. In the stillborn infant there was uniform density throughout the chest, obliterating all of the pulmonary structure as well as the heart. The same density appears in the chest of newborn infants before breathing. But with the inrush of air evidences of lung structure, with changes in the shape of the chest, immediately begin to show. If delivery is easy the lungs may appear fully expanded five minutes afterward. In others, especially after prolonged, difficult delivery, expansion may take place slowly, leaving entire lobes or scattered areas atelectatic. In such areas the density was uniform, and comparable to that of the unexpanded lung; it did not appear pathological, though it might simulate the density of pulmonary edema or bronchopneumonia. Full expansion required from five minutes to two weeks. The bases seemed to be the last parts to expand completely, the lateral borders being probably the first. The anterior borders near the mediastinum seemed to come later. No particular change in the shape or position of the diaphragm or the heart and great vessels was observed. There was, however, a very marked change in the shape of the chest, due to the change in the angle of the ribs. In full expansion the rib was at right angles with the spine or, in an anteroposterior position, appeared even to incline upward, with the upper ribs rising and obliterating the slope of the lateral chest wall. The increase in the anteroposterior, transverse and sagittal diameters after expansion, as compared with those before expansion, did not seem to account for a quantity of air sufficient to produce the radical changes in the roentgenogram. In other words, the atelectatic lung would almost fill the intrathoracic space of the fully expanded chest. The abdomen of the newborn infant, before any act of respiration, shows no evidence on the roentgenogram of containing gases or air, but, simultaneously with the appearance of air in the lungs, air is also seen in the stomach, later increasing and extending into the intestine, whether breathing is normal or artificial. Within the first two weeks the position of the ribs described gives the thorax a cylindrical shape, with a gradual but slight slope from apex to base. The hemidiaphragms may be partially or decidedly dome-shaped, the right being slightly higher than the left. The heart and mediastinum resemble those of the adult, except that the left ventricle appears more prominent and the great vessels less so. The trachea lies in the midline, bifurcating about the third thoracic vertebra and entering a well-defined hilum on either side. The hila are of fairly uniform density without evidence of irregularities which might be considered as glandular tissue, and are reasonably wide in comparison to the size of the chest. In either hilum may be seen small columns of air extending to the periphery of the lung and surrounded by linear markings of considerable density; these are quite prominent, especially the directly ascending and descending markings. Their density is generally uniform, although an occasional area of increased density, simulating a calcified lymph node may be seen. The periphery of the lungs is uniformly clear, with an occasional suggestion of septal markings. A density of the thymus area was noted in only a few cases.—*A Roentgenographic Study of the Infant Chest as Seen at Birth, W. W. Wasson, J. Am. M. Ass., October 18, 1923, lxxxiii, 1240.—(J. B. A.)*

Tuberculous Pulmonary Cavities in Infants.—Cavity formation in pulmonary tuberculosis in the first two years of life is not exceptional. It is most common between the ages of six and eighteen months, its occurrence under three months being rare. Cavities form by softening and breaking down of the primary lesion or of caseous pneumonic areas. The lesions almost invariably show no tendency to healing. The clinical course is acute or subacute. Characteristic physical signs of cavity are usually absent, and it is only by the rentgenogram that an antemortem diagnosis of ulceration can be made. The usual site of the cavitation is in the middle and lower lobes, centrally located or near the lung roots; in one case an apical cavity was seen. The right lung is more frequently involved. As a rule ulceration is largely confined to one lobe or to one side of the chest. In two years 7 cases of ulcerative pulmonary tuberculosis in children under two years of age were seen at the Cleveland City Hospital; 5 were verified at autopsy. All except one were roentgenographed. In only one case was the cavity (1 cm. in diameter) not demonstrated in the roentgenogram. In only one case were there physical signs of cavity, and these did not appear until three weeks after it was shown roentgenographically. There were 6 males and 1 female. Six of the 7 cases were in colored babies. The youngest in the series was six months old, and the oldest twenty-four months. The intracutaneous tuberculin test was positive in all. In some cases the cough was quite annoying, while in others it was not so. There were no hemoptyses, although three of the cavities were of such size as to occupy an entire lobe or more. Three of the 7 developed meningitis. A roentgen chest examination of an infant with meningitis

may disclose extensive pulmonary tuberculosis, thereby establishing the etiology. In all the cases autopsied, extensive tuberculosis was found in most of the other organs. Tuberculous bronchopneumonia may be difficult to differentiate from nontuberculous conditions. The presence of a widened mediastinal shadow, and enlarged hilum shadows coincident with tuberculous adenitis, favors pulmonary tuberculosis. The tuberculin test is of distinct value. The failure of a pneumonic process to clear up in the usual time may be the first indication of tuberculosis. Cavity formation is practically diagnostic of tuberculosis. As a rule there is a marked difference in the well-being of the patients with extensive tuberculous pneumonia as compared with a nontuberculous pneumonia, the former not appearing so profoundly ill. A case history and reproductions of 6 roentgenograms are included.—*Ulcerative Pulmonary Tuberculosis in Infants, H. L. Farmer, Am. J. Roentgenol. & Radium Therapy, October, 1924, xii, 327.*—(*J. B. A.*)

Enormous Silent Cavity in Infant.—In this case the autopsy showed an enormous cavity, which had given no auscultatory signs, accompanied by tracheobronchial adenopathy and diffuse congestive lesions with caseation in both lungs.—*Enorme caverne tuberculeuse silencieuse chez un nourrisson de 5 mois, Poinso and G. Darcourt, Meeting, Comité médicale des Bouches-du-Rhone, May, 1924, reported in Presse Méd., June 25, 1924, no. 51, 550.*—(*A. P.*)

Protein Therapy in Infantile Tuberculosis.—In a review of the literature the various theories of the mode of action of foreign protein therapy in tuberculosis are discussed. Cieszynski, admitting the difficulty of exact conclusions as to the efficacy of a given mode of therapy in so chronic a disease, attempted protein therapy in cases treated at the hospital for two to four weeks by ordinary methods without result. Serial injections of from 2 to 10 cc. of horse serum, used in pulmonary and intestinal cases, produced severe reactions at the sites of injection, and were not followed by satisfactory results. Serial injections of sterile milk, however, brought about marked improvement in the general condition of those patients capable of satisfactory reaction to therapeutic excitants. The results, in improvement of appetite, in gain in weight, etc., were sufficiently good to warrant continuing the investigation of this therapy.—*La protéinothérapie dans la tuberculose infantile, F.-K. Cieszynski, Arch. d. méd. d. enf., November, 1924, xxvii, 662.*—(*P. J. W.*)

Prognosis of Tuberculosis in Infancy.—The authors quote a previous study made in 1916, in which they found that 30 to 35 per cent of tuberculous infants survived. They mention the following as "undeniable facts:" (1) The younger the infant the worse the prognosis; (2) in infants as a rule the tuberculous process is localized in the lungs and bronchial lymph nodes, and there is a great tendency to dissemination. The four factors on which the severity and course of the infection depend are (1) dosage of infection and resistance of the body, (2) weight of the child, (3) nature of feeding, whether breast or artificial, and (4) hygienic surroundings of the child. In six cases, all of which are alive and well, the only evidence of tuberculous infection was the positive Pirquet test. They report a case in which miliary tuberculosis of the lungs, generalized tuberculides, and dactylitis were present. The patient improved markedly for a number of months, both clinically and radiographically, but died of tuberculous meningitis 18 months after the first examination.—*Prognosis of Tuberculosis in Infancy, M. S. Reuben and A. de G. Smith, Arch. Pediat., August, 1924, xli, 529.*—(*P. J. W.*)

Increase of Infantile Tuberculosis and Housing Crisis in Paris.—Of 1,380 children under two years and hospitalized at the Children's Medical Clinic from January, 1921, to June, 1924, 6.25 per cent were diagnosed tuberculous, one-third of them being from five to seven months old. There was parental tuberculosis in 80 per cent of cases. Since the war infantile tuberculosis has increased. In 1921 it was the cause of 4 per cent; now from 7 to 11 per cent of the total infantile mortality. The increase seems related to housing conditions in Paris, which are frequently very unsanitary. It is urgent that babies should be removed from infectious adults soon after birth, that supervised centres be organized for placing them with suitable families, also open air nurseries, and that Calmette's vaccination be practised.—*Augmentation de la tuberculose du nourrisson et crise du logement, Nobecourt and Boulanger-Pilet, Meeting, Académie de Médecine, July 8, 1924, reported in Presse Méd., July 12, 1924, no. 56, 591.*—(*A. P.*)

Classification of Juvenile Tuberculosis.—The Committee of the American Sanatorium Association recommends that the term *hilum tuberculosis* be added to the present classification of tuberculosis. It should be used to define those cases of tuberculosis that present the following symptoms and signs: *Symptoms: Local:* Frequent

"colds," cough, hoarseness, rarely loss of voice, often all local symptoms are entirely absent, and when they appear they are usually transitory. *Constitutional:* Undue fatigue, lassitude, nervous irritability, anorexia. Weight may be normal, but is more often subnormal, or there is a retardation of growth; rarely loss of weight. The musculature is usually flabby and the posture shows evidence of muscle fatigue. Sweating, not the type known as night-sweats, but a tendency to profuse perspiration without apparent cause. Occasionally brief periods of unexplained elevation of temperature above 99.6°, but rarely over 100.5°. The frequent associaton of phlyctenular keratitis or conjunctivitis, scrofuloderma and lupus is always to be kept in mind. *Physical signs: Percussion:* Paravertebral dulness: The impaired resonance is found between the scapulae and often extends upward to the supraspinous fossae. *Parasternal dulness* is most frequently found at the right of the sternum and may be erroneously interpreted as due to an enlarged heart. *Auscultation:* Voice and breath sounds are usually normal. Râles are rarely found and, when present, are usually due to some other cause than tuberculosis. *Roentgen findings:* One or more of the following conditions to be present: 1. Prominent bronchial trunks with definite beaded appearance, or nodular in outline, extending from the hilum. 2. Enlarged lymph nodes, varying in number and density, and imbedded in the thickened tissues of the hilum. One or both hila may be involved. 3. Diffuse shadows of varying density throughout the hilum. Occasionally there are cloudy masses with irregular outlines due to involvement of the deep parenchyma. *Tuberculin test:* The Pirquet or intracutaneous test must be positive. All other sources of toxemia or infection that could produce similar symptoms must be excluded before a positive diagnosis of hilum tuberculosis can be made.—*Proposed New Classification of Juvenile Tuberculosis, H. D. Chadwick, Boston M. & S. J., December 4, 1924, cxci, 1069.*—(*B. T. McM.*)

Observations on Children Admitted to Tuberculosis Dispensary.—In a study, initiated in 1915, a series of 667 children, admitted to the tuberculosis clinic of the Johns Hopkins Hospital either because of illness or exposure to tuberculosis, has been investigated. In addition to securing detailed histories in each case, complete physical examinations, roentgenograms of the chest and Pirquet skin tests were made at intervals. Of the entire group, 169 children were found normal in every respect except that they reacted positively to the Pirquet test; 107 showed no signs of any pathological condition and reacted negatively; 207 had various nontuberculous diseases; and the remainder had definite or probable tuberculosis in one or more organs. Clinical tuberculosis was found present in a close familial associate in 56.82 per cent of the cases; in a collateral relative in 7.5 per cent; and probably in the family in 6.15 per cent. The highest incidence of infection among 517 children given the Pirquet test, in relation to their exposure to infection, was encountered in the homes of the demonstrated open cases (77.7 per cent); but, contrary to *a priori* reasoning, infection was slightly more prevalent among those without known exposure (68.8 per cent) than among those living with parents or sibs who had clinical tuberculosis (64 per cent). To explain this apparent discrepancy Krause's suggestion is recalled that children over the age of three years are essentially "ground animals"—their games are ground games. Contamination of the hands by raw sputum is frequent, and hand to mouth infection may easily occur. Acceptance of the idea means recognition of the universality of contact of all children with tuberculosis, and explains the equal frequency of infection among these series of exposed and nonexposed children; the danger of exposure to the "open" case, nevertheless, is not to be underrated. During the year 1919–20 and again in 1923 efforts were made to reëxamine as many of the children as possible. In the first period only 133 returned, and in the second only 60. No essential difference in physical or mental development was apparent between those that had reacted positively and those that had failed to react to tuberculin. Each child that returned was retested with tuberculin cutaneously applied. The increased percentage (11.85) of positive reactions in 1920 parallels roughly the generally observed increasing incidence of the older ages. In many, tested at shorter intervals, the intensity of the reaction varied from time to time. Whether or not this indicates an ebb and flow of the primary infection, or new infections from without, is not clear. No correlation between variations in intensity of reaction and in clinical condition was established. Ten children who reacted positively to tuberculin in 1915–16 failed to react in 1920; seven of these still reacted negatively in 1923, as did 3 others who reacted positively in 1920. None of them was ill; none had an infectious disease to cause a state of anergy. May not these children be representative of a group in whom childhood infection does die out completely? May they be regarded as suggesting that there is an undetermined class that develops clinical tuberculosis as

the result of infection from without in adult life, rather than from the reactivation of a latent infection acquired before the age of puberty? The clinical and anatomic response in the two classes need be no different if the phenomenon of immediate or accelerated response in the immunized occurs in hosts once infected with tubercle bacilli, as is suggested by animal experiments. One boy gave a positive Pirquet test in 1915, a negative one in 1920, a positive in 1921, and again a negative in 1923. Such an observation indicates that many of the infections in early life, whether single or several, may be relatively transient, and that probably small successive infections from without do occur in childhood. These may act as a beneficient protective mechanism or lead ultimately to the development of chronic disease. In a group of 50 who returned for observation in 1923 and most of whom had approached, reached or passed puberty, a lower incidence of positive tuberculin reactions, as compared with similar tests previously, was noted, indicating that protection conferred by infection with the tubercle bacillus is relative, not absolute, and that the immunity decreases in nonprogressive or subsiding lesions. A review of roentgenograms made over a period of from two to eight years indicates that, in the absence of symptoms, a moderately dense uniform shadow extending from the mediastinum and limited by the lateral border of the inner zone of the lung, and shadows interpreted as due to pulmonary fibrosis limited by the lateral margin of the middle zone of the lung, proved of little or no prognostic or clinical moment. Calcification in or about the hilum was seen in the films of 7 of these children, whereas in another group of normal negatively reacting young individuals it was noted in only one. The data reported indicate the imperative need of similar more inclusive studies extending over long periods of years if final information concerning phthisiogenesis in general, and the significance of infection in childhood in particular, is to be had. The observations recorded indicate: 1. Though the maximum opportunity for tuberculous infection of the child is present in the homes of the phthisical, extrafamilial and extramural foci are significant sources of early contamination. 2. The variation in the response to the cutaneous tuberculin test indicates the validity of the hypothesis that infection may vary in degree from time to time and may even die out. A positive reaction does not foretell what will be the course of the infection nor does it indicate whether the infection is an initial one or not. 3. Slightly enlarged mediastinal shadows in the roentgenogram are noted more often in children exposed to tuberculosis than in those not so endangered. However, as they are present in many children with negative skin tests, but with slight or moderate grades of tonsillar, adenoid, or cervical lymph glandular hyperplasia, the interpretation of such shadows as necessarily indicative of a tuberculous origin of the condition is not always justified. 4. Basal lesions, generally undetected clinically but disclosed by roentgenographic study, are often residual changes due to measles, pertussis, pneumonia, tonsillar, and other nontuberculous diseases. 5. Repeated roentgenograms made at long intervals of time indicate how unwise it is to draw sweeping inferences from a single examination. This is true, not merely because a single observation does not indicate whether a given shadow is to increase or decrease, but because of the rapidly changing point of view in the interpretation of given variations from the normal.—*Observations on Children Admitted to a Tuberculosis Dispensary, C. R. Austrian, Tubercle, October, 1924, vi, 29.—(J. B. A.)*

Tuberculous Infection of Child from Ephemeral Contact.—It is believed today that in the great majority of cases tuberculous infection necessitates intimate and sufficiently prolonged contact. Debré has shown that contact sufficient to result in demonstrable infection ordinarily requires at least a month. The small bacilliferous droplets inhaled are usually immediately ejected by coughing, or do not reach the alveoli in sufficient numbers, or under the proper condition to be absorbed. Debré has also shown that it is exceptional for a child, who has been for as long as six months in contact with an open case, to escape infection. The case cited by Bernard and Paraf is that of a child born in the maternity ward of a hospital. The mother had open ulcerocaseous phthisis and showed numerous bacilli in the sputum. Soon after birth she was separated from the child, but on three occasions for about five minutes each she took the child in her arms and kissed it. At the end of two weeks mother and child were conducted separately to the Hospital Laennec and placed in separate wards. No other person suspected of tuberculosis came in contact with it. The tuberculin skin reaction was negative up to the fifth week, when there was a slight rise of temperature and pulse, and it became positive. However, the child continued to develop normally, and radiography revealed nothing abnormal. Other comparable cases recorded in the literature are those of Unverricht, Schloss and Petscherck, but in all of them contact was for at least an hour. One of these died

of meningitis; another of tuberculous bronchopneumonia. The facts cited in the case of Bernard and Paraf are in accord with experiments of Flügge, Calmette and others, showing that a guinea pig may be infected by inhaling 20 to 100 bacilli if they are deposited on the bronchial bifurcation. The short respiratory passages of the infant and its rapid respirations favor this. The separation of mother and child should, therefore, be absolute if it is to be effective. They should not even be transported in the same conveyance.—*Contamination tuberculeuse chez le nourrisson apèrs contact éphémère, L. Bernard and J. Paraf, section d'études scientifiques di l'Oeuvre d. l. Tuberc., May 10, 1924, reported in Rev. d. l. Tuberc., June, 1924, v, 419.*—(*A. P.*)

Clinical Aspects of Pulmonary Tuberculosis in Childhood.—Tuberculosis tends to assume a serious and fatal aspect in infancy and early adult life. The ages of school life, five to fifteen or thereabouts, are comparatively exempt. This is not for want of infection or even of tuberculous lesions; it must be that a notable immunity exists during this period of life. But among such material, infected but resistant, there must surely, in addition to a few deaths, be numerous cases of disease running a more benign course and ending in recovery. Both radiographic and postmortem records show that this is so. Symptomatically, the affected child gives a history of frequent coughs and colds, attacks of unexplained fever, loss of weight, anorexia, and asthenia. In the hospital class malnutrition is often the most striking feature, while among more prosperous children, subjected to strenuous school games, unexplained attacks of fever, often with cough and vomiting, more often bring them to the physician. On physical examination there are no notable stethoscopic signs. A right-sided paravertebral dulness is the hallmark of the tuberculous child, and the diagnostic value of this sign is as good as are the apical crepitations and impairment which mark a tuberculous infiltration in phthisis of the adult. The area has a well-defined crescentic edge which, by percussing from without inward, is quite easy to mark out. The sign is not due to lymph-node masses or other gross tuberculous changes, but is a mere surface reflection of distant changes around the lung root; the radiograph may not show any corresponding shadows. The area is probably due to lung shrinkage around the root, associated with a partial collapse, and is always associated with a slight loss of resonance over the entire lung. It seems to be caused by pressure of enlarged bifurcation lymph nodes on the right branch of the pulmonary artery; in any case it simply implies lymph-node enlargement. The sign is present in almost all tuberculous children, and is absent from the healthy; it persists in the tuberculous long after the disease is quiescent. The question of activity must be decided on symptoms. Localized crepitations, evidence of surface infiltration, may be absent, appearing only in the later stages of progressive disease. Bronchitic râles may be present, and sometimes in older children apical phthisis is found. But the common type of disease is "hilum tuberculosis." It constitutes "first infection" or Rancke's "primary complex," consisting typically, when it occurs in the pulmonary area, of a single lung lesion and caseous disease in the corresponding lymph nodes at the hilum, often with involvement of the bifurcation and tracheobronchial nodes on the same side, with spread, in some cases, to those of the opposite side. The child at this point is presumed to be becoming "allergic" but is perhaps not yet fully so. As the next step, the radiograph may reveal mottling around the root on one or both sides, when the stage of the "primary complex" has passed. The mechanism of this spread may be explained in a number of ways: *1.* Spread by continuity. This cannot accomplish any wide dissemination. *2.* Rupture of caseous root nodes into the trachea or bronchus, only an accidental occurrence. *3.* Hematogenous invasion. This may occur in some cases but is not typical of hilum tuberculosis. *4.* Retrograde lymphatic extension due to blocking of the lymph stream by caseation of its draining nodes. This is a mode of spread which even the morbid anatomist has sanctioned. Evidence from an anatomic, radiographic and clinical viewpoint is presented to support this lymphatic backwash as the probable mechanism in the majority of these cases. The characteristics of hilum tuberculosis are conditioned partly by this mechanism and partly by peculiar tissue reactions in a soil becoming "allergic," but not yet fully so. This partial allergy may itself constitute the protection of school age, apart from any concomitant immunity, since it appears to favor a repair unaccompanied by the disastrous cavitations of adult disease. Considering the X-ray picture, in infancy the shadows of disease fall on a comparatively clean surface but in a child of ten or twelve years the normal radiogram often shows considerable, and perhaps suspicious shadowing. Many of these may be due to nontuberculous changes; others may represent healed tubercles. The more we study the matter the more we must be impressed with the importance of the soil,

and be prepared to accept the presence of the seed almost as a *sine qua non*. The question should surely be no longer "Is he tuberculous?" but rather, "How much is he tuberculous?" Let the balance tip well on the side of immunity and we need not be over anxious as to how many tuberculous foci have been thrown into the other scale. Problems are suggested for discussion, such as the treatment of the tuberculous school child and his ultimate fate.—*Pulmonary Tuberculosis in Childhood. The Clinical Aspect, C. Riviere, Brit. M. J., August 30, 1924, no. 3322, 359.—(J. B. A.)*

Diagnosis of Pulmonary Tuberculosis in Children.—Severe and fatal pulmonary tuberculosis between the ages of five and fourteen seems to be diminishing in England. Cases with sputum and tubercle bacilli, or with crepitations and signs of cavitation, are advanced cases. In the earlier and slighter cases of so called hilum disease the symptoms are as follows: The child is losing flesh, and shows pallor, loss of appetite and debility. There is lassitude, and the patient is always tired and sitting by the fire. Headaches are frequent, and the child is moody and peevish. The mother may have noticed flushing in the afternoon, indicating fever, and night-sweats may occur. A chronic cough may have been present since an attack of measles, whooping cough or influenza, and the child may have frequent colds. On examination a general loss of tone may be noted. In the skin this is shown by a dry, dirty, dough-like appearance with diminished elasticity; by pallor, which may not mean a marked anemia; and by excessive growth of downy hair. In the muscles and ligaments loss of tone causes a giving way where an effort is needed to keep the structures in position. Scoliosis and flat-foot are the most common manifestations. Walking is an effort, and the muscles generally are suffering from toxic disturbance. The heart is irritable, and after an exercise test the pulse quickens unduly and takes too long to return to normal. Wasting is evident, and in thoracic infection is perhaps more marked at the back of the neck, in the upper arms, and between the scapulae; here also are the downy hair and the venules, if present. These signs justify a suspicion of tuberculosis, which is strengthened if a history of exposure to infection can be obtained. On examining the chest we do not expect to find crepitations or areas of dulness, except for an impaired note at the roots as described by Riviere. One cannot rely on percussion and roentgen-ray examination alone to distinguish healed and active lesions. On auscultation, harsh breathing and especially cogwheel breathing, should be listened for; the latter may be heard at a base or at an apex in front, and is a very suspicious sign. It may be accentuated by nasal breathing if there is obstruction. D'Espine's sign of whispering pectoriloquy below the second dorsal vertebra, when the child whispers "Three-thirty-three," is another important sign of early trouble. In the presence of positive clinical findings, roentgen-ray evidences of enlarged lymph nodes or woolly areas may define the extent of the disease, but not its condition of healing or activity. The Pirquet reaction does not distinguish active from healed lesions and is, therefore, of little use except in young children. Improvement under treatment confirms the diagnosis. The great secret of success in the treatment of such cases is to take them early and treat them for a sufficiently long time. Rest is the first essential, and much can be done in town hospitals and town houses in the way of successful open-air treatment if rest is enforced. Fresh air, sunlight and, if possible, a sunny, breezy climate are needed. Diet is important; a liberal protein diet often succeeds better than too much fat. As a medicine nothing approaches codliver oil in its effect. Residential schools, where the child may be kept uninterruptedly under treatment until fibrosis and calcification are established, are needed.—*Discussion on Pulmonary Tuberculosis in Childhood, III, Diagnosis of Pulmonary Tuberculosis in Children, C. P. Lapage, Brit. M. J., August 30th, 1924, no. 3322, p. 364.—(J. B. A.)*

Failures in Diagnosis of Childhood Tuberculosis.—It is easy for the physician to overlook signs and symptoms in tuberculosis or to misinterpret physical signs, and this often leads to incorrect diagnosis. Inadequate knowledge of the disease, the errors of modern textbooks and the lack of knowledge of allergy and hypersensitiveness on the part of the physician contribute to these errors of diagnosis. The Pirquet cutaneous test should be much more widely used than at present. Statistics on 300 missed diagnoses are given.—*Über Fehldiagnosen bei kindlicher Tuberkulose, M. Pfaundler, Klin. Wchnschr., Sept. 9, 1924, iii, 1679.—(H. S. W.)*

X-Ray in Diagnosis of Pulmonary Tuberculosis of Children.—Roentgen pictures taken with too soft tubes give false images, since they show small shadows, mostly vascular, which may be confused with productive tuberculous lesions. Lung tissue changes, like peribronchial connective

tissue increase, vascular statis and glandular enlargement, need not be of tuberculous origin, but may be the consequence of a chronic catarrh, or of infectious diseases with involvement of the lung and air passages. Therefore, a negative tuberculin test is of special significance.—*Beitrag zur Bewertung des Röntgenbildes für die Diagnose der kindlichen Lungentuberkulose, G. Simon, Ztschr. f. Tuberk., April, 1924, xl, 34.—(H. J. C.)*

Roentgenographic Aspects of Childhood Tuberculosis.—Pulmonary lesions are considered as of the following types: *1. Miliary tuberculosis:* The findings may be negative, yet on postmortem examination miliary tuberculosis may be present throughout the lungs with enlarged mediastinal lymph nodes. Tuberculous lymph nodes do not show roentgenographically unless they have passed the stage of enlargement and congestion and have become caseous or calcareous. *2. Bronchopneumonic tuberculosis: Type A:* The median shadow may be widened, but the hilum shadows are almost invariably increased and both lung fields are dotted with rounded, sharply defined areas of uniform opacity, almost all of the same size and equally distributed. The diameter of these shadows varies from 1 to 3 mm. Lesions more than 3 mm. in diameter may coalesce over large areas, followed by evidences of cavitation. Physical signs may be few or lacking until gross consolidation and cavitation have developed. This is the most common form of pulmonary tuberculosis in children. *Type B:* Acute bronchopneumonic phthisis in children seems to be rare. Roentgenographically, it is indistinguishable from a bronchopneumonia which is breaking down, except that in this case the other lung is usually affected. Large cavities may be formed with spread of infection to the other lung. *Type C:* Occasionally, and usually in the lower lobes, a caseous area may be detected in the parenchyma which may have been the focus of the miliary spread. *3. Hilum tuberculosis:* This is uncommon and shows first as an increase in the size and density of the hilum shadow. Both hila are occasionally affected, but usually one more rapidly than the other. The normal picture is replaced by a denser homogeneous shadow with diffuse and indefinite edges, except where these connect with the interlobar fissures; spread seems to be more rapid along the latter, and from them densities shade into clear parenchyma. The density eventually may reach the lateral chest wall, preceding which rarefaction indicative of cavitation appears at its centre. Simultaneously, discrete studdings appear in the other lung, increasing in size and undergoing cavitation. Bronchopneumonic or hilum disease seems always to be bilateral. *4. Chronic tuberculosis:* After the age of eight the adult type of chronic phthisis is seen more often. First the hilum increases in size and density; from this point an elongated branching shadow, marked by discrete circular densities, extends to the apex. These branchings communicate with one another, and at the apex, or below it, is an area of consolidation with, later, cavity formation. The hilum shadow increases further, and caseous lymph nodes may be visible at the edge of the median shadow. Opacities representing calcified nodes may also appear at the hilum. The heart may be small, and the chest flattened on the affected side. Rarely, a large cavity or a number of smooth-walled cavities have been seen, usually in the lower lobes. In differential diagnosis one must be familiar with normal variations in the lung picture, and pathological variations, such as increased hilum and linear shadows persisting possibly for months after measles, pertussis and influenza, shadows of the thymus, and deviation of the trachea. Other conditions to be distinguished are abnormal obesity, patches of scleroderma, splayed out rib ends in rickets, pleural exudates, unresolved pneumonia, acute lung abscess, congenital atelectasis, bronchopneumonias due to other infections, syphilis of the lung, bronchiectasis, fibrosis of the lungs and tumors.—*Discussion on Pulmonary Tuberculosis in Childhood, II. The Radiological Aspect, D. C. Suttie, Brit. M. J., August 30, 1924, no. 3322, 362.—(J. B. A.)*

Fibroid Phthisis in Child.—In a very chronic case of tertiary phthisis in a child, beginning before puberty and ending in death, the X-ray showed an apical to caudal progression of a purely productive process, with definite contraction of the primarily involved upper lobe of the right lung, while individual caseous pneumonic areas appeared at the end of the disease.—*Ein Beitrag zur Kasuistik der cirrhotischen Phthise des Schulkindes, F. Scheidemandel, Beitr. z. Klin. d. Tuberk., June, 1923, lvi, 111.—(H. J. C.)*

Primary Apical Pulmonary Tuberculosis of Children.—Thirty children (22 girls and 8 boys), with primary foci in the apex of the lung, were examined in an endeavor to ascertain the effect of this lesion on growth and the configuration of the chest. Two-thirds of the children were of average length, and 13.3 per cent below and 20 per cent above the average. In only 9 per cent of unselected cases with a primary tubercu-

lous focus (not necessarily in the apex) were the children above the average in length. Fifty per cent of the children had an average chest circumference for their age, 46.7 per cent a narrower chest, and 3.3 per cent a broad chest. Only 22 per cent of well children in the same walk of life had narrow chests, and this was present in only 37 per cent of the children with primary foci irrespective of location. It would seem, therefore, that the narrow chest is of significance even in childhood.—*Über Kinder mit tuberkulösem Primärherd in der Lungenspitze, J. Peiser, Monatschr. f. Kinderhk., April, 1924, xxviii, 42.*—(*T. C. H.*)

Tuberculosis of Mesenteric Lymph Nodes.—A tuberculous infection of the intestinal mucosa may result in regional involvement of the lymph nodes of the mesentery and of the retroperitoneal spaces. These nodes caseate and form masses of varying size. Omentum, mesentery, and intestines become variously adherent. Results of caseation may be many. Such infection is usually due to the bovine type of tubercle bacillus and is most often milk-borne. With regard to treatment, the authors do not feel that surgery is ever justified except in cases in which there is intestinal obstruction or perforation. They present the case of a boy aged 19 months. He was fed unpasteurized, raw cow's milk, presumably from a tuberculin-tested herd. Four days prior to examination he had vomited and had marked colic. Appetite had been good, diet normal, stools normal. He was anemic and weighed 19 pounds, 8 ounces. There was a hard irregular mass the size of an adult fist in the left flank beneath the spleen, separated from it and from the kidney. Pirquet and intracutaneous tuberculin tests were strongly positive, hemoglobin 35 per cent, red cells 3,100,000. In addition to general and dietetic measures, heliotherapy was instituted. By the twentieth day the abdomen received exposure to sunlight three hours a day. In four months the child gained five pounds. During the following nine months he had several intestinal attacks (partial obstruction was considered a possibility). His tonsils were then removed because of marked infection. One month after this he vomited and passed but little from the bowels. Peristaltic waves were seen. On operation the adhesions were broken up and free passage of intestinal contents assured. A large mass of caseating lymph nodes was left in. There was of course extensive involvement of surrounding peritoneum. One year later, on continued treatment, the child weighed 29 pounds, 4 ounces, the mass could barely be felt, and the general condition was excellent. —*Tuberculosis of the Mesenteric Lymph Nodes, with Report of an Unusual Case, H. R. Mixsell and C. E. Farr, Arch. Pediat., June, 1924, xli, 402.*—(*P. J. W.*)

Primary Tuberculosis of Striated Muscle.—Primary localization of tuberculosis in muscle is exceedingly rare. It must be considered secondary to tuberculous infection elsewhere. Histologically, the process involves connective tissue surrounding the muscle cells. The case of a boy, aged 8, is presented. Clinically, the tuberculous abscess in the calf-muscles was primary. The diagnosis was confirmed by histological and bacteriological examinations. In this condition, the local pains are not severe, and are usually absent in the morning, increasing toward evening. Limping is noticeable when the leg muscles are the ones involved. Treatment is surgical. The prognosis in the majority of cases is good.—*Sur la tuberculose primitive des muscles striés, A. Merlini, Arch. d. méd. d. enf., November, 1924, xxvii, 641.*—(*P. J. W.*)

Tuberculous Meningitis with Associated Infection.—The first case was that of a girl of eleven, the total duration of whose illness was ten weeks. The principal complaint was headache. Examination was essentially negative except for the high fever. Blood culture persistently showed micrococcus tetragenus in pure culture. Nine days before death she developed rigidity of the neck and irregular breathing. Lumbar puncture revealed tubercle bacilli in the spinal fluid without any tetragenus infection. Cases of "tetragenic septicemia" are very rare in childhood. The second case was that of a boy of twelve, who had been vomiting for several days. He had complained of headache and malaise. There was rigidity of the neck, no fever, clear spinal fluid, in which, however, Gram-negative diplococci were present. In two days after this examination the child had fever, rigidity of the neck, and positive Kernig. There was marked lymphocytosis in the spinal fluid, and a number of tubercle bacilli were demonstrated in addition to the Gram-negative diplococci. The action of these diplococci on glucose, and especially on lactose, the absence of agglutination by serums agglutinating meningococci, and the irregular coloration by the Gram stain, led us to consider that the germ was a pseudomeningococcus, the *Diplococcus crassus*. After marked improvement, this patient was seen four months later, suffering from tuberculous peritonitis, which followed the usual course. The clinical improvement after the meningi-

tic signs was temporary, for at the time of the later examination he was very pale and weak. Of course at this time we must regard this not as a clinical cure, but as a remission in the tuberculous meningitis.—*Deux observations de méningite tuberculeuse avec infection associée J. Columbe and D. Foulkes, Arch. d. Méd. d. Enf., August, 1924, xxvii, 477.*—(*P. J. W.*)

Colloidal Gold Reaction in Tuberculous Meningitis.—In a table of Lange reactions of 11 spinal fluids from known cases of tuberculous meningitis, a fairly typical curve is as follows: 1112210000. Tuberculous meningitis more nearly conforms to the reaction with greatest intensity in dilution of 1:160 and 1:320. It may, however, vary considerably from this in certain cases, showing a progressive variation as the meningitis extends. Other conditions which clinically may be easily confused with tuberculous meningitis may show a colloidal gold reaction that is not dissimilar from that which is seen in certain cases of tuberculous meningitis.—*Further Observations on the Lange Gold Chlorid Reaction on the Cerebrospinal Fluid in Infants and Young Children, C. G. Grulee, Am. J. Dis. Child., August, 1924, xxviii, 147.*—(*P. J. W.*)

Erythema Nodosum with Tuberculous Bacillemia and Meningitis.—Erythema nodosum is often but not always connected with tuberculosis. A case of a boy two and one-half years old is reported. On admission he had typical erythema nodosum on both forearms and legs, high fever, marked prostration, positive Kernig, cervical rigidity, and left cervical adenitis. The severe illness had lasted a week before admission, the erythema nodosum three days. He died two days after admission. There was no doubt of the tuberculous meningitis and bacillemia, the meningitis being traceable to the adenitis, and occurring before it could be effectually resisted.—*Erythema Nodosum with Tuberculous Bacillemia and Meningitis, F. P. Weber, Brit. J. Child. Dis., April–June, 1924, xxi, 119.*—(*P. J. W.*)

Treatment of Childhood Tuberculosis with Saprophytic Bacilli.—Karfunkel reports favorable results in 200 cases of childhood tuberculosis of different types, obtained following the injection of a saprophytic, non-acid-fast bacillus of the *radicola* group. More than 100 became Pirquet negative. Some focal reaction, with slight fever, attended the treatment. Caution must be observed in active pulmonary tuberculosis. No definite value was found in the treatment as a prophyiactic measure.—*Zur Behandlung der Kindertuberkulose, Karfunkel, München. med. Wchnschr., August 22, 1924, lxxi, 1166.*—(*E. R. L.*)

Artificial Pneumothorax in Tuberculous Children.—All phthisiologists know the gravity and rapidity of evolution of pulmonary tuberculosis in children and the almost uniformly fatal outcome. In the Benjamin Franklin Annex of the *Hôpital Debrousse* and the *Hôpital-Sanatorium* of Brevannes there was opportunity for studying the efficacy of therapeutic pneumothorax in infantile tuberculosis. During a period of two years there were under observation 500 young subjects (from 5 to 15 years) with open pulmonary tuberculosis. Of these, 59 had practically unilateral disease, but in 15 adhesions interfered with pneumothorax, leaving 44 cases, which together with 5 induced by Babonneix and one by Méry brought the total to 50 cases. Kuss's technic was used. Of these, 23 began treatment over a year ago, and only 3 died. The immediate results are always excellent and there are a dozen patients treated between 18 months and 2 years who are in perfect health. In 10 more the results were likewise satisfactory, but an effusion developed with some constitutional disturbance and fever. The best results, as in the case of adults, are obtained by keeping the little patients under sanatorium discipline and hygiene.—*Le pneumothorax thérapeutique chez l'infant tuberculeux, P. F. Armand-Delille, Section d'Études Scientifiques de l'Oeuvre de la Tuberculose, March 1, 1924, reported in Rev. d. l. Tuberc., June, 1924, v, 386.*—(*A. P.*)

Prevention of Tuberculosis among Children in Morocco.—The authors note certain special aspects of the tuberculosis problem in Morocco. The disease is very common in the cities, where the mortality varies between 33 and 28 per 10,000. Tuberculosis existed in Morocco prior to European penetration. From the pediatric point of view, antituberculosis work is particularly difficult because of the practically complete seclusion in which mothers and young children live. Men are accessible only when outside their homes. This of course does not apply to the relatively small Jewish and European populations. Dispensaries for treatment far outnumber those for prophylaxis. The authors are particularly enthusiastic about the "sun-gardens" established at Rabat—preventoria corresponding to our open-air schools. From their observations it is clear that a warm, sunny climate is no insurance against tuberculosis, unless the sunshine and fresh air are properly util-

ized for the benefit of the children.—*Préservation de l'enfance Marocaine contre la tuberculose, J. Colombani and L. Lapin, Arch. d. Méd. d. Enf., October, 1924, xxvii, 577.*—(*P. J. W.*)

Tuberculosis of Animals.—This is an excellent review of practically the experimental literature for the year 1921, the pertinent points of 303 articles being briefly presented.—*Die Tuberkulose der Tiere mit Besonderer Berücksichtigung der Literatur des Jahres 1921, H. Rautmann, Beitr. z. Klin. d. Tuberk., June, 1923, lv, 398.*—(*H. J. C.*)

Tuberculin-Reacting Cattle without Tubercle.—Now that tuberculin testing of cattle is extensively done, the number of cattle giving a tuberculin reaction but showing no lesion at autopsy is more frequently encountered and of more significance. These amount to about 20 per cent or more of all reactors in large numbers of tests. They are found especially in herds in which only a few members are reactors. In a certain few of these, foci are possibly overlooked. A number of reactors without foci have been known to have peculiar skin lesions (nodules). These nodules have been thought by some to be tuberculous, and were studied histologically and inoculated into guinea pigs as well as on media. Out of 23 cases no bacteria grew on media and no guinea pig developed tuberculosis, although acid-fast bacilli were found microscopically in 7 cases. May not nonpathogenic acid-fast bacilli, which are incapable even of growth on ordinary culture, be the factors which occasionally produce sensitiveness to tuberculin? If this is true, the complexion of the problem of eradication changes considerably.—*No-Lesion and Skin-Lesion Tuberculin-Reacting Cattle, E. G. Hastings, B. A. Beach and C. W. Weber, J. Am. Vet. Med. Assn., October, 1924, lxvi (new series, xix), 36.*—(*H. S. W.*)

Disinfection of Quarters for Tuberculous Cattle.—Sunlight and diffuse daylight, if time is allowed, are good disinfecting agents, as are steam, hot water or scrubbing, but chemical agents are usually necessary. Chloride of lime is valuable in disinfecting lots or runways. It is often advisable to have the farmer install windows in his barn in the proper places for the sunshine to reach areas which need disinfection. No system of disinfection can be expected to kill off all bacilli after a herd has been tested, because cattle carry bacilli for some time, but many can be destroyed. All manure and trash should be removed.—*Disinfection of Premises in Connection with the Eradication of Tuberculosis, J. A. Barger, J. Am. Vet. Med. Assn., October, 1924, lxvi (new series, xix), 58.*—(*H. S. W.*)

Postmortem Methods for Cattle Reacting to Tuberculin.—The ideal conditions are a warm, well-lighted room and an animal that has been fasted, rested and properly bled. The operator should pay particular attention to the lymph nodes and, in this connection, should know the age of the animal, for these structures differ in appearance and in disease incidence in the young and the old. Tuberculosis of the submaxillary and mesenteric nodes is rare in adult cattle, which more usually present involvement of the retropharyngeal, bronchial and mediastinal nodes, and of the liver and lungs. Involvement of the digestive tract is more common in the young. Actinomycosis, parasitic infections and tumors are conditions that sometimes are confused with tuberculosis. Fullest details as to autopsy procedure are given.—*Notes on Postmortem Methods in Cattle Reacting to Tuberculin, T. H. S. Lowrey, J. Am. Vet. Med. Assn., October, 1924, lxvi (new series, xix), 61.*—(*H. S. W.*)

Elimination of Tuberculosis from Herds.—There is a great tendency toward the development of new reactors in badly infected herds. A study of five herds was carried out, with the use of varying combinations of intracutaneous, ophthalmic, intrapalpebral and subcutaneous tuberculin tests. When the subcutaneous test was applied simultaneously with the intracutaneous, or at any time before reaction to the latter developed, the intracutaneous test was not typical. But no such relationship existed between the subcutaneous and ophthalmic tests. Many animals formerly negative to subcutaneous or intracutaneous tests gave positive results with the eye test. The "follow up" ophthalmic test, which consists of repeated test doses in the eye, yielded an additional 50 per cent of reactors over the regular test. All reactors at autopsy were found to be diseased. This procedure also reveals "plugging" cases. The "follow-up" method is accomplished as follows: Intracutaneous injection is done at the same time that a "sensitizing ophthalmic tablet" is placed in the eye. At the 72-hour reading another sensitizing tablet is placed in the eye. Readings are taken as usual. Five days later another tablet is deposited in the eye and an intrapalpebral injection made. Sixty hours later a fourth tablet is instilled in the eye and observations taken.—*Eliminating Tuberculosis from Badly Infected*

Herds, R. L. Conklin, J. Am. Vet. Med. Assn., 1924, lxvi (new series, xix), 13.—(H. S. W.)

Asphyxiating War Gases.—The term "war gas" does not adequately cover the conditions meant. Most of the so called war gasses were not really gases but vapors, or solid or liquid particles. Chlorine was the only real gas employed in the late war. *Vapors:* Every liquid body emits vapors even at ordinary temperatures, the amounts being influenced by the pressure of the outside medium and limited by the staturation point of this medium. In general, liquids having a high vapor pressure at ordinary temperature have a low boiling point, and *vice versa*. In turn, the boiling point is generally high in proportion to the molecular weight. One may group the liquids employed by the enemy in the last war in three categories: *1:* Liquids with a low boiling point. Phosgene, is a typical example, boiling at 8°. Such liquids evaporate rapidly and penetrate deeply, thanks to the smallness of the molecule, composed of only four atoms. *2:* Liquids with a boiling point at about that of water. The two chief representatives of this class are chloropicrine and diphosgene. These liquids evaporate more slowly, but fairly rapidly, and also penetrate the lung deeply.—*3:* Liquids with a high boiling point. Such are the yperite, or sulphide of dichlorethyl, with a boiling point of 212°. These liquids evaporate slowly. They infect the ground for a long time but do not penetrate deeply into the lung. Their action is more superficial and vesicant or lachrymogenic. *Solids:* Very minute particles of solids may be kept in suspension in the air, due to viscosity. These suspensions are comparable to colloidal solutions. On the battle fields clouds are created in this manner; in the interior of an ordinary shell is placed a glass phial containing the toxic solid. By the force of the explosion the glass breaks, and the high temperature which exists at the moment of explosion vaporizes the solid, which later condenses in small particles. As the substances thus employed must not be decomposed by heat, only a few are available. The principal ones used were the chloride and cyanide of diphenylarsine. There are three possible modes of action of toxic substances used: (1) on the nervous system, as hydrocyanic acid, (2) on the blood, as carbon monoxide, and (3) caustics, such as chlorine, bromine, and phosgene. The last type was chiefly used during the war.—*Les gaz asphyxiants de combat, P. Erculisse, Rev. Belge d. l. Tuberc., July, 1924, no. 7, 220.—(A. P.)*

Key to Abstractors

A. P.: Andrew Peters, Loomis, N. Y.
B. T. McM.: B. T. MacMahon, Loomis, N. Y.
E. R. L.: Esmond R. Long, Chicago, Ill.
H. J. C.: H. J. Corper, Denver, Col.
H. S. W.: H. Stuart Willis, Baltimore, Md.
J. B. A.: J. Burns Amberson, Loomis, N. Y.
T. C. H.: T. C. Hempelman, St. Louis, Mo.
P. J. W.: Park J. White, St. Louis, Mo.